



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2018**

**TECHNICAL SCIENCES P1**

**MARKS: 150**

**TIME: 3 hours**

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This question paper consists of 15 pages including 1 data sheet.

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**INSTRUCTIONS AND INFORMATION**

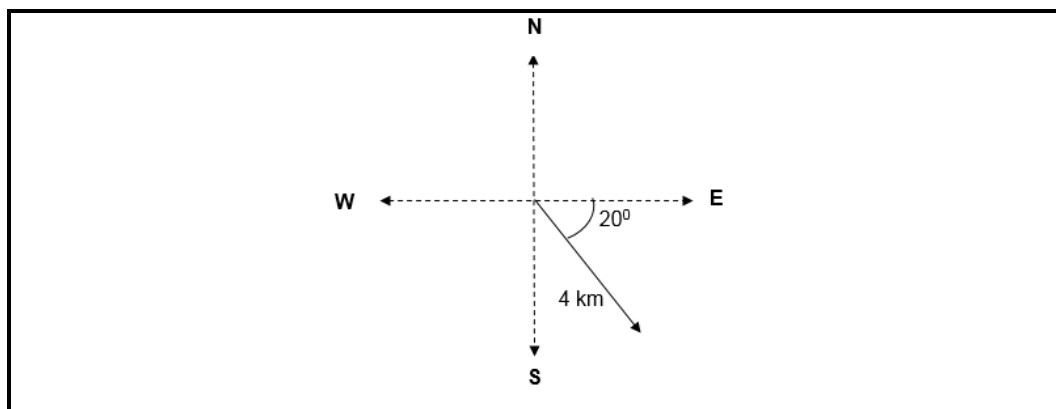
Read the following instructions carefully before answering the questions.

1. Write your FULL NAME and SURNAME in the appropriate spaces in the ANSWER BOOK.
2. Answer ALL the questions.
3. Start each question on a NEW page in the ANSWER BOOK.
4. You may use a non-programmable calculator.
5. Appropriate mathematical instruments may be used.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Show ALL formulae and substitutions in ALL calculations.
8. Round off your FINAL numerical answers to a minimum of TWO decimal places.
9. Give brief motivations, discussions, etc. where required.
10. A data and information sheet is attached for your use.
11. Write neatly and legibly.

**QUESTION 1: MULTIPLE-CHOICE QUESTIONS**

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A–D) next to the question number (1.1–1.10.) in the ANSWER BOOK, for example 1.9 A.

- 1.1 The diagram below shows a bricklayer's movement from his home to the construction site.

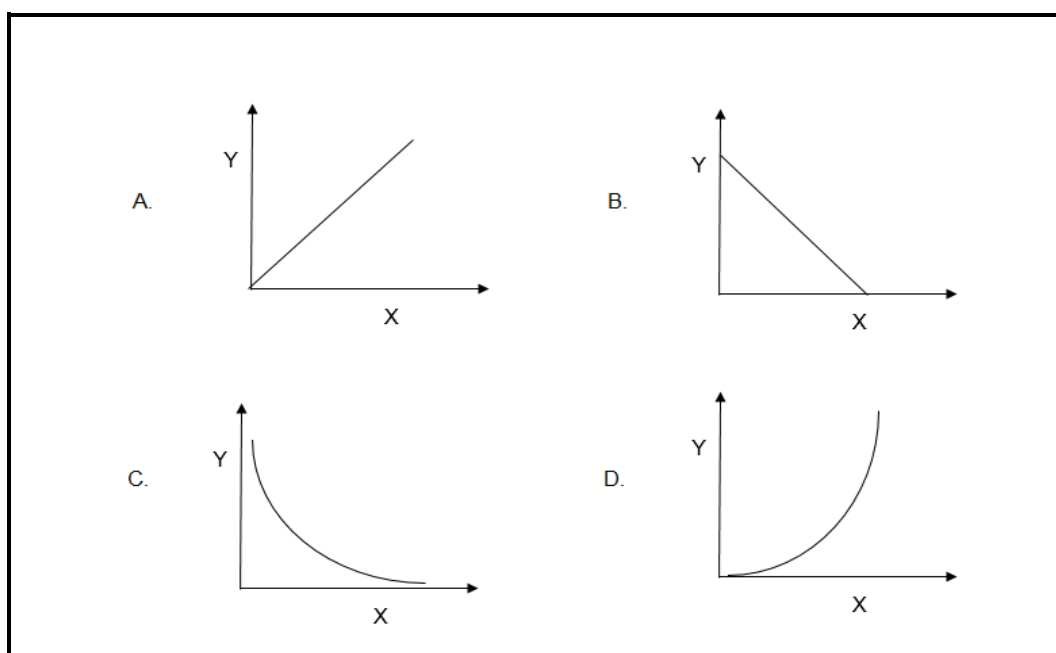


Which ONE of the following correctly represents his movement?

- A Displacement of 4 km on a bearing of  $110^\circ$
- B Displacement of 4 km on a bearing of  $20^\circ$
- C Displacement of 4 km on a bearing of  $250^\circ$
- D Displacement of 4 km on a bearing of  $70^\circ$

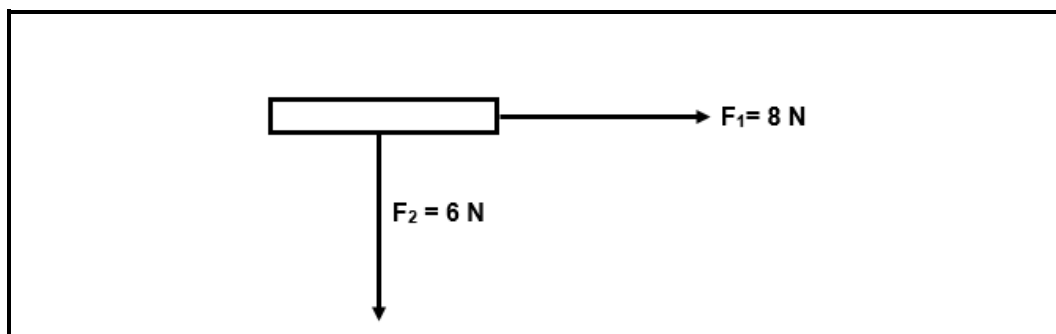
(2)

- 1.2 Two physical quantities, X and Y, are directly proportional. Which ONE of the following graphs represents this relation?



(2)

- 1.3 Two workers applied forces,  $F_1 = 8 \text{ N}$  and  $F_2 = 6 \text{ N}$ , to a concrete block as shown in the figure. Force  $F_1$  is perpendicular to force  $F_2$ .



The magnitude of the resultant force experienced by the block can be found by using ...

- A the sine rule.
  - B Pythagoras theorem.
  - C the cosine rule.
  - D the triangle law. (2)
- 1.4 The figure below shows two vectors,  $P$  and  $Q$  acting on an object. They have the same line of action.



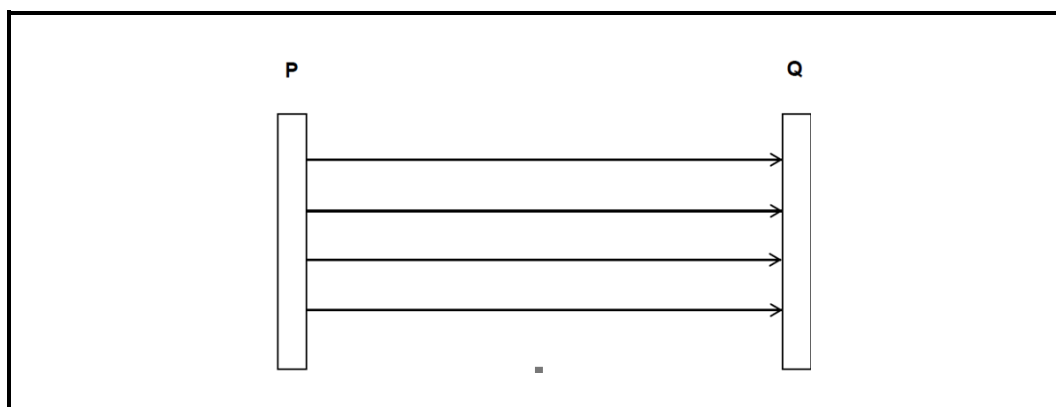
- $P$  and  $Q$  are called ...
- A co-planar vectors.
  - B co-linear vectors.
  - C parallel vectors.
  - D concurrent vectors. (2)
- 1.5 On a frictional surface, it is easier to keep an object sliding than it is to cause it to start sliding. This is because ...
- A  $\mu_s > \mu_k$
  - B  $\mu_s < \mu_k$
  - C  $f_s > F_N$
  - D  $f_s < f_k$  (2)
- 1.6 Which ONE of the following is NOT a ferromagnetic substance?

- A Iron
- B Cobalt
- C Nickel
- D Copper (2)

- 1.7 The phenomenon caused when charged ions from the Sun enter the atmosphere mainly near the poles is known as ...
- A the Aurora Borealis.  
B a photo electric effect.  
C electromagnetic induction.  
D mutual induction. (2)

- 1.8 The force between two point charges is  $F$  when they are placed at a distance,  $d$ , from each other. What will be the magnitude of the force if the distance between them is halved?
- A  $\frac{1}{4} F$   
B  $F$   
C  $2 F$   
D  $4 F$  (2)

- 1.9 Which ONE of the following statements is correct about the electric field between two parallel plates?



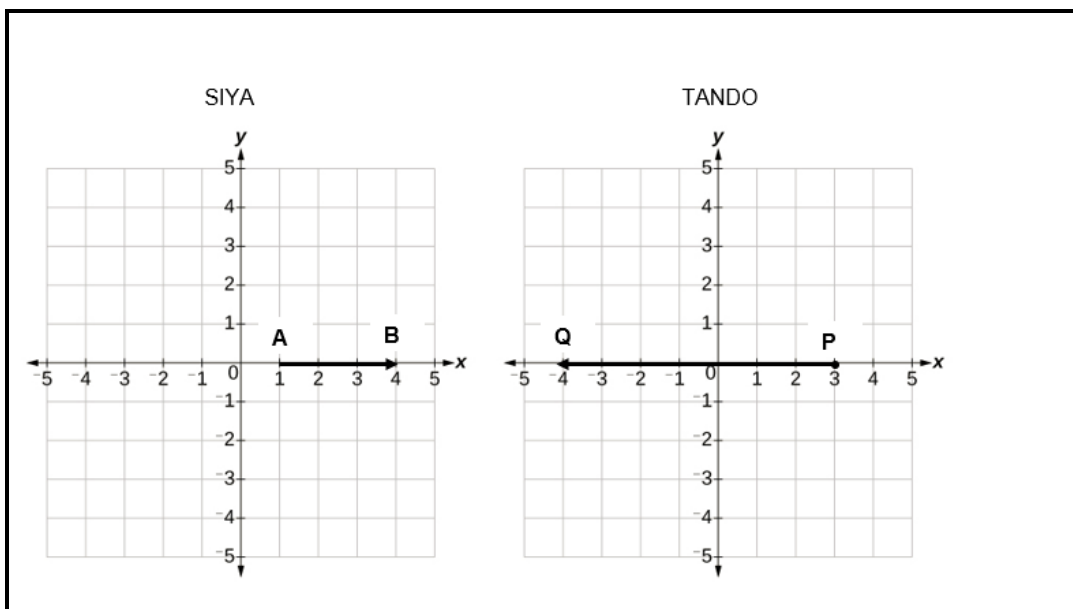
The electric field is ...

- A non-uniform.  
B uniform.  
C maximum at P.  
D maximum at Q. (2)
- 1.10 The resistance inside a cell is called ... resistance.
- A external  
B terminal  
C internal  
D cell (2)

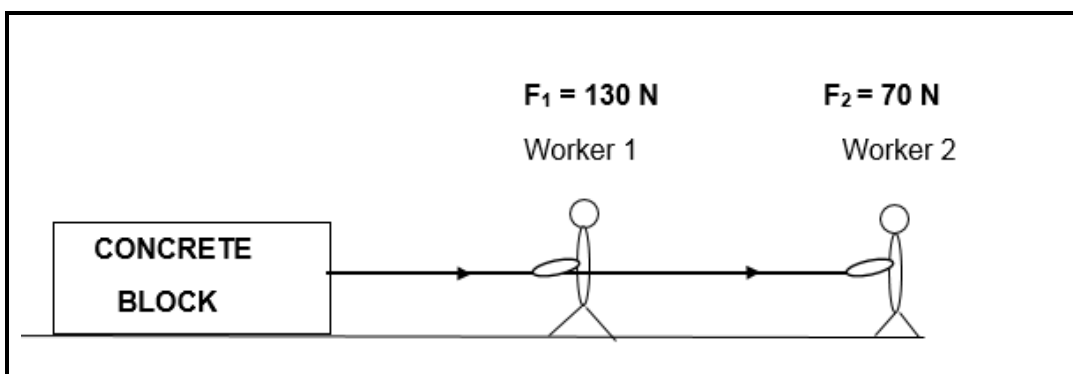
[20]

## QUESTION 2

- 2.1 Displacements of two learners, Siya and Tando, are shown on the Cartesian co-ordinates system. Siya travelled from A to B and Tando travelled from P to Q. (Scale: 1 main scale division = 1 m.)

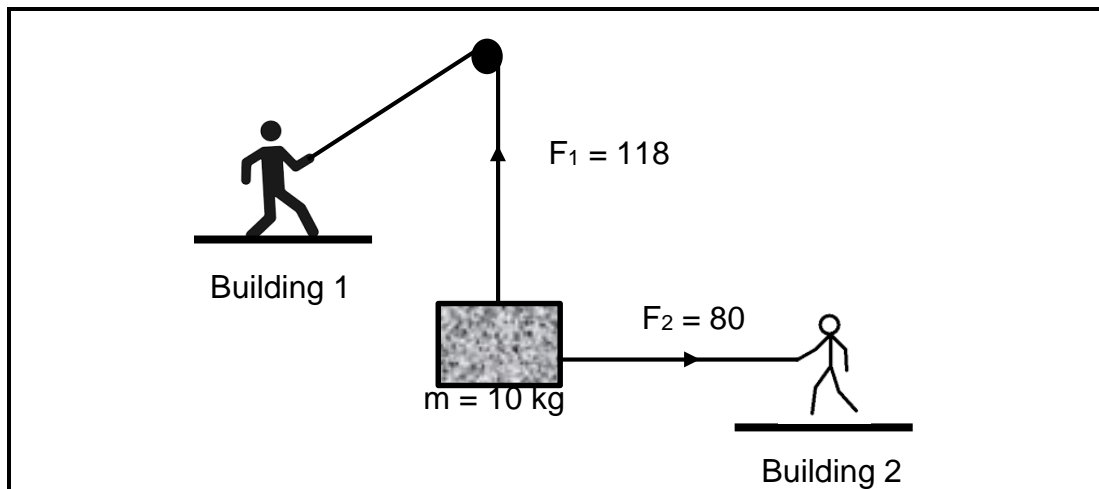


- 2.1.1 What is the distance travelled by Siya? (2)
- 2.1.2 What is the displacement of Tando? (2)
- 2.2 Two construction workers are pulling a concrete block by using a long rope as shown in the figure below. Worker 1 exerts a force of  $F_1 = 130 \text{ N}$  and worker 2 exerts a force of  $F_2 = 70 \text{ N}$ .



- 2.2.1 Define the term **resultant vector**. (2)
- 2.2.2 Using a scale diagram, find the resultant force experienced by the block. (20 N : 10 mm) (3)

- 2.3 Two men exert force on a block of bricks from two buildings are as shown in the figure below. The man on building 1 lifts the bricks upwards with a force  $F_1 = 118 \text{ N}$  and the other man, on building 2, pulls the bricks horizontally with a force  $F_2 = 80 \text{ N}$ .

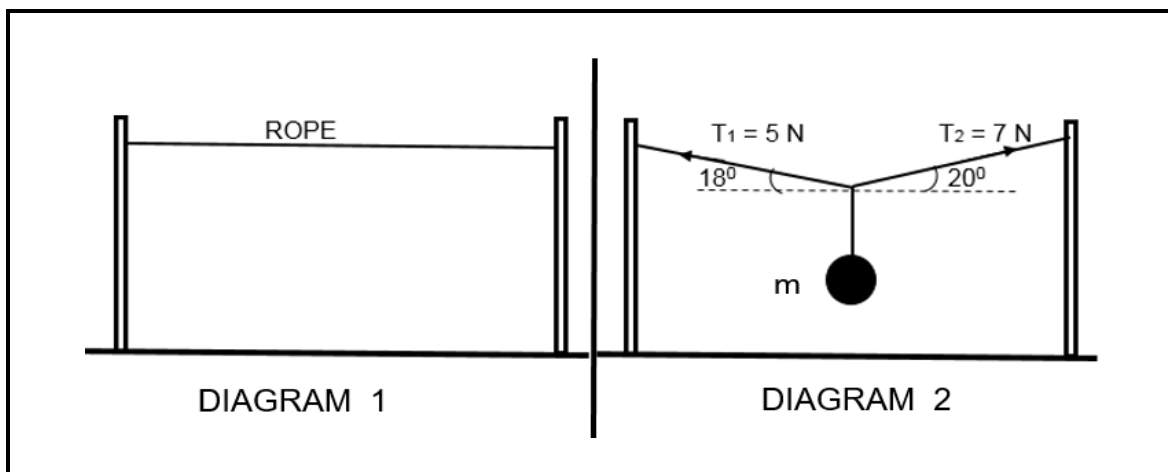


- 2.3.1 Define **co-planar vectors**. (2)
- 2.3.2 Name ONE non-contact force and ONE contact force in the above diagram. (4)
- 2.3.3 Calculate the resultant force acting on the block of bricks in the vertical direction. (5)
- 2.3.4 Hence calculate the magnitude of the resultant force acting on the block of bricks. (3)

**[23]**

### QUESTION 3

DIAGRAM 1 below shows a ROPE tied to two poles so that it is horizontal. DIAGRAM 2 shows an iron ball of mass  $m$  suspended from the same rope so that it sags.



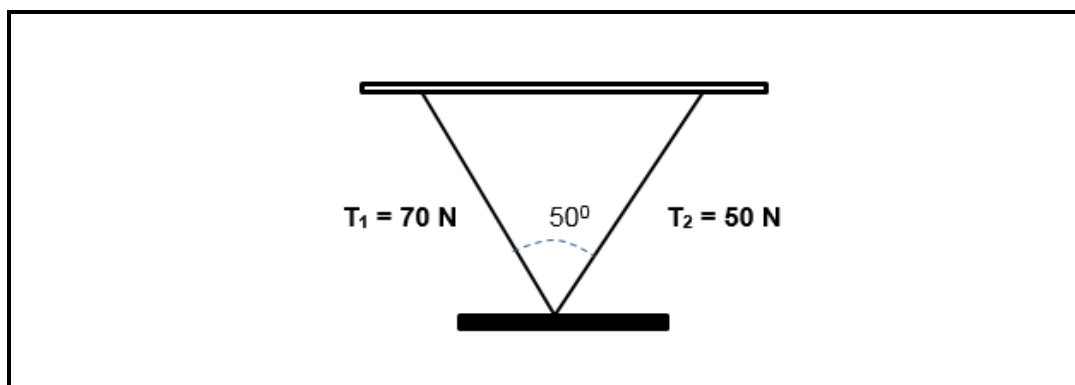
3.1.1 Calculate the vertical component of tension  $T_1$ . (3)

3.1.2 Calculate the vertical component of tension  $T_2$ . (2)

3.1.3 Calculate the resultant of vertical components of  $T_1$  and  $T_2$ . (3)

3.1.4 Hence calculate the mass  $m$  of the iron ball. (4)

3.2 A steel beam is supported by two ropes as shown below.  $T_1 = 70 \text{ N}$  and  $T_2 = 50 \text{ N}$  are the tensions on the ropes and the angle between the ropes is  $50^\circ$ .



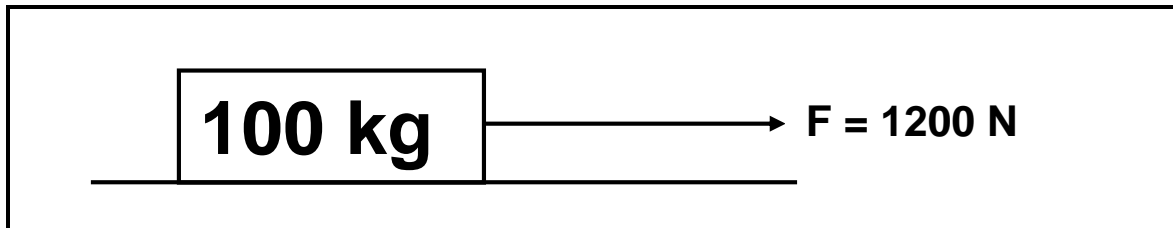
3.2.1 State the parallelogram law of forces. (2)

3.2.2 Use the parallelogram law of forces and determine graphically the magnitude and direction of the resultant tension of tensions  $T_1$  and  $T_2$ . (7)

[21]

**QUESTION 4**

A box with a mass of 100 kg is being pulled over a frictional surface with a horizontal force of  $F = 1\,200\text{ N}$  as shown in the figure below. The coefficient of kinetic friction, is  $\mu_k = 0,2$ .

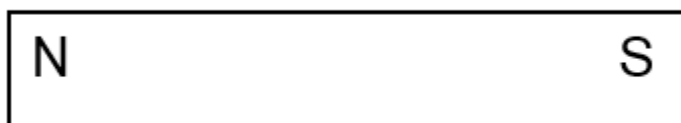


- 4.1 Define **force of friction**. (2)
- 4.2 Draw a free body diagram showing all the forces acting on the box. (4)
- 4.3 Calculate the kinetic frictional force experienced by the box. (4)
- 4.4 What would be the magnitude of the frictional force if the object is moving with constant velocity? (2)
- 4.5 What would be the resultant force acting on the object in QUESTION 4.4? (1)
- 4.6 How would the kinetic frictional force change  
(Write down INCREASES, DECREASES or REMAINS THE SAME.)
- 4.6.1 If the force  $F$  acts at an angle of  $30^\circ$  to the horizontal? (1)
- 4.6.2 If the mass of the box is increased? (1)

**[15]**

**QUESTION 5**

5.1 A bar magnet with N-pole and S-pole is shown in the figure below.



5.1.1 Define the term *magnetic field*. (2)

5.1.2 Copy the figure above on to your ANSWER BOOK and draw the magnetic field lines around the bar magnet. (3)

5.2 The above bar magnet is cut into two pieces as shown in the figure below.



5.2.1 What pole does number **1** indicate? (1)

5.2.2 What pole does number **2** indicate? (1)

5.2.3 What would happen if pole **1** is brought closer to pole **2**? Explain your answer. (2)

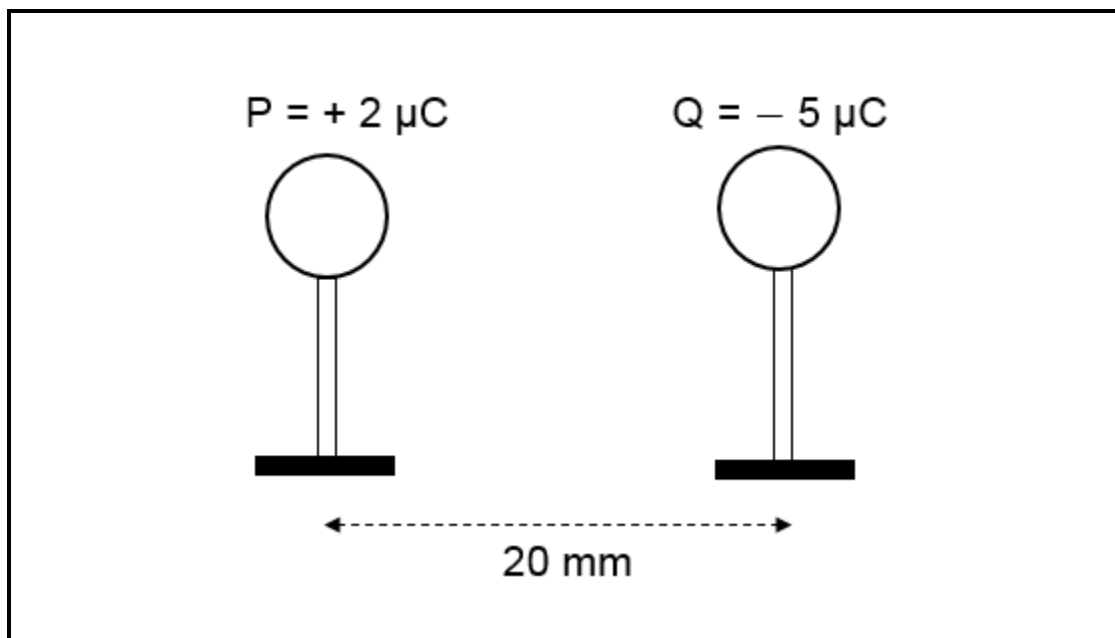
5.3 5.3.1 What is meant by *geomagnetic storm*? (2)

5.3.2 Give TWO effects of a geomagnetic storm. (2)

**[13]**

**QUESTION 6**

- 6.1 Two identical small charged spheres, **P** and **Q**, on insulated stands, are placed at a distance of 20 mm apart as shown in the diagram below. **P** has a charge of  $+2 \mu\text{C}$  and **Q** has a charge of  $-5 \mu\text{C}$ .

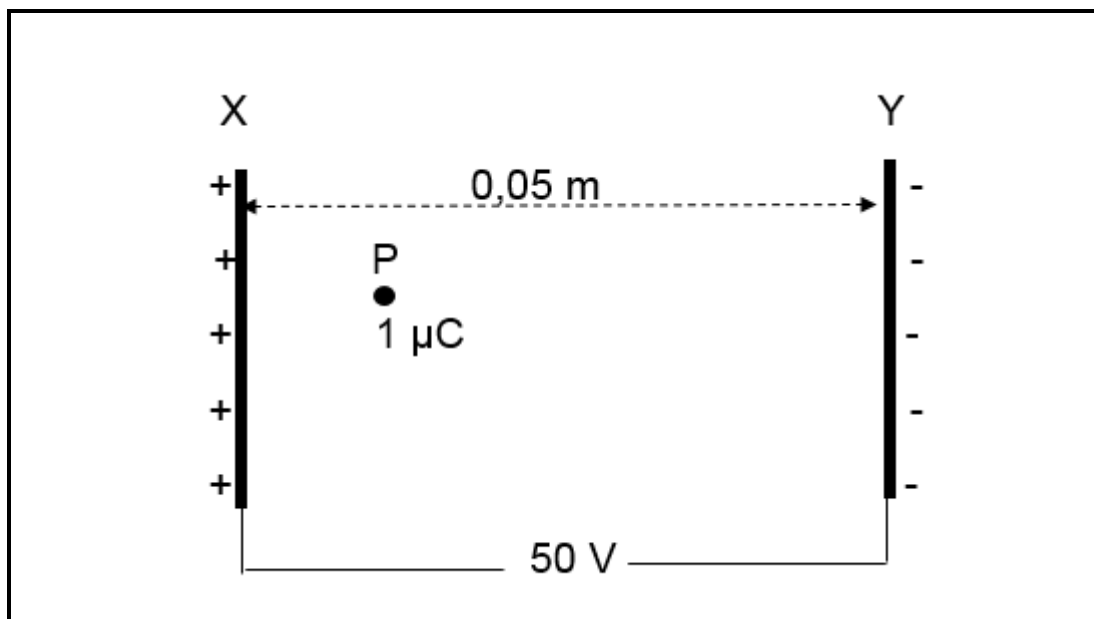


- 6.1.1 State Coulomb's law of electrostatics in words. (2)
- 6.1.2 Calculate the force exerted by **P** on **Q**. (4)
- 6.2 The charged sphere **Q** is brought closer towards **P** and is made to touch **P**. The sphere **Q** is then moved back to the original position which is 20 mm from **P**.
- 6.2.1 State the principle of conservation of charge. (2)
- 6.2.2 What kind of charge will be transferred when the spheres are in contact? (2)
- 6.2.3 Calculate the new charge on **P** and **Q** after they have made contact and have been separated again. (3)
- 6.2.4 Draw the electric field pattern between **P** and **Q** after they have made contact. (3)

**[16]**

**QUESTION 7**

The potential difference across two parallel plates is 50 V. The distance between the plates is 0,05 m.

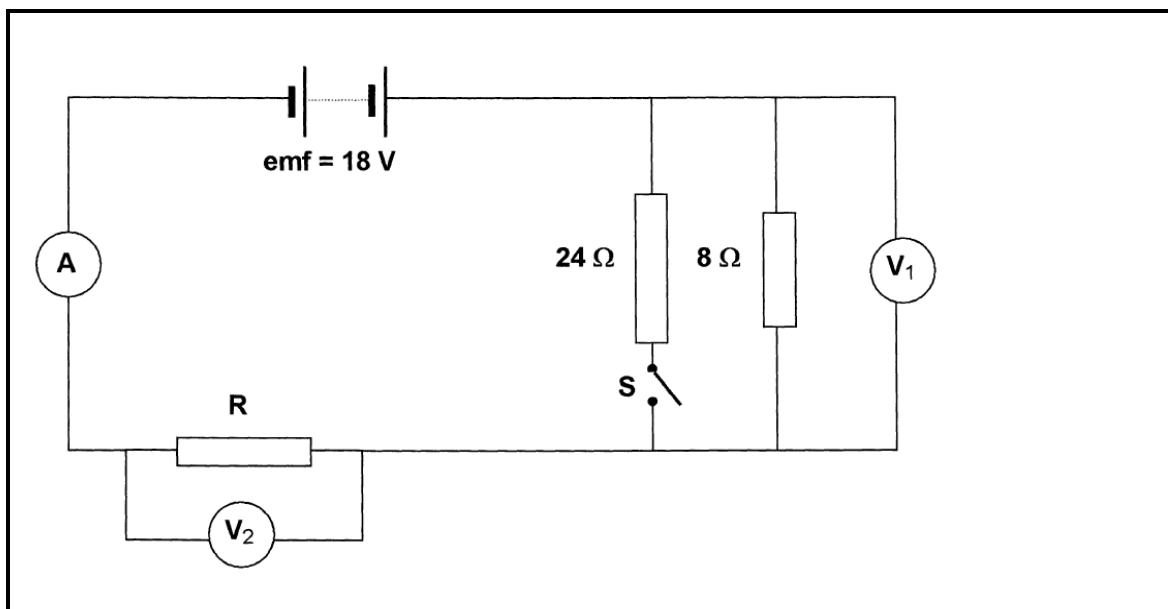


- 7.1 Define the term **electric field**. (2)
- 7.2 Calculate the magnitude of the electric field between the parallel plates. (3)
- 7.3 A small positive charge of  $1\mu\text{C}$  is placed at point **P**.
- 7.3.1 In which direction does this charge move? Towards plate **X** or towards plate **Y**? (1)
- 7.3.2 Convert  $1\mu\text{C}$  into C. (1)
- 7.3.3 Calculate the force experienced by the charge. (3)
- 7.4 Give any TWO applications of electrostatics in technology. (2)

**[12]**

**QUESTION 8**

In the circuit represented below, the battery has an emf of 18 V. The battery, ammeter and the connecting wires have negligible internal resistance.

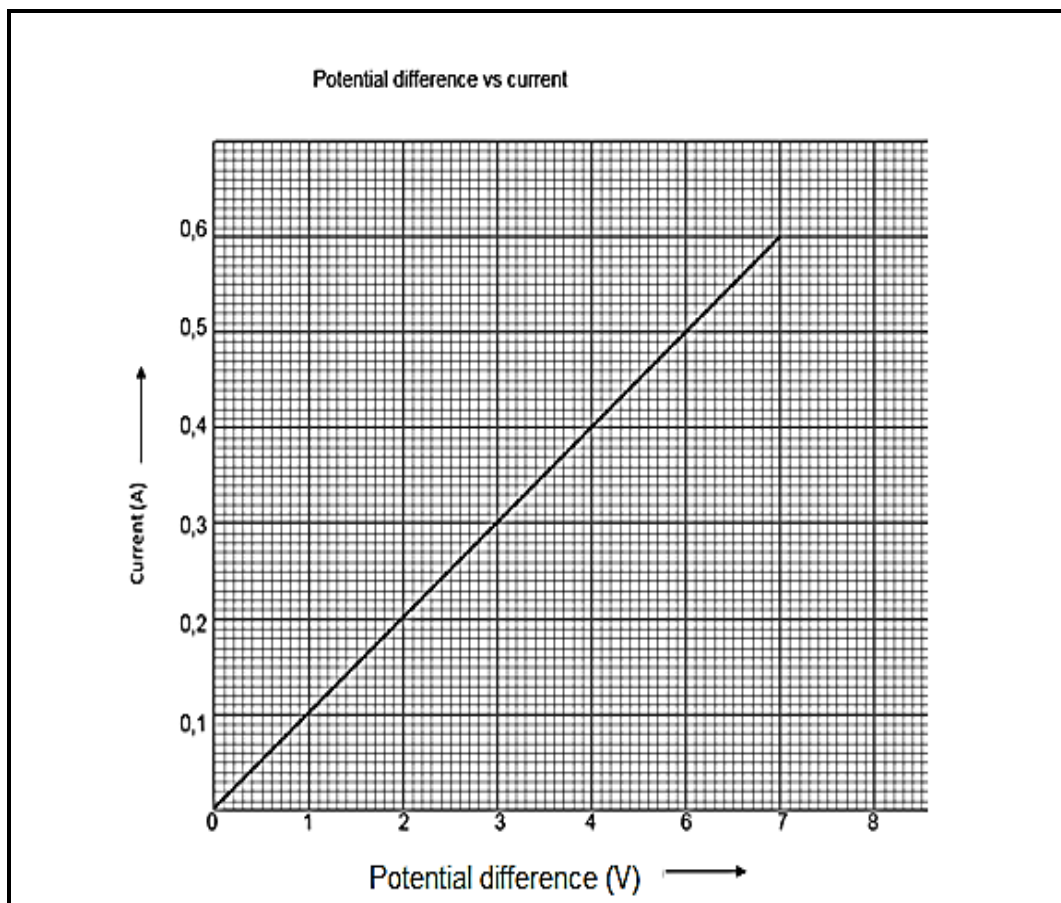


- 8.1 Define the **emf** of the battery. (2)
- 8.2 Switch **S** is open.
- 8.2.1 Calculate the reading on the voltmeter  $V_1$ , if the reading on the ammeter **A** is 1,5 A. (3)
- 8.2.2 Calculate the resistance of resistor **R**. (4)
- 8.2.3 What would the reading on the ammeter be if resistor **R** is removed from the circuit? (2)
- 8.3 Switch **S** is now closed. Calculate effective resistance of the parallel combination. (3)

**[14]**

**QUESTION 9**

- 9.1 A group of Grade 11 learners conducted an experiment to find the relationship between potential difference across a resistor and current through it. They obtained the following graph.



- 9.1.1 Name FOUR factors affecting the resistance of a conductor. (4)
- 9.1.2 State Ohm's law in words. (2)
- 9.1.3 Write down the:
- (a) Independent variable (1)
  - (b) Dependent variable (1)
- 9.1.4 Calculate the resistance of the resistor. (4)
- 9.2 What is the difference between an *ohmic* and a *non-ohmic conductor*? (4)
- [16]**

**TOTAL: 150**

**DATA FOR TECHNICAL SCIENCES GRADE 11  
PAPER 1**

**INFORMATION SHEETS – PAPER 1**

**TABLE 1: PHYSICAL CONSTANTS**

NAME	SYMBOL/SIMBOOL	VALUE/WAARDE
Acceleration due to gravity	$g$	$9,8 \text{ m}\cdot\text{s}^{-2}$
Coulomb's constant	$k$	$9 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2}$

**TABLE 2: FORMULAE**

**FORCE**

$F_{\text{net}} = ma$	$f_k = \mu_k N$
$f_s^{\text{max}} = \mu_s N$	$F_g = mg$

**ENERGY**

$K = \frac{1}{2}mv^2$ or $E_k = \frac{1}{2}mv^2$	$U = mgh$ or $E_p = mgh$
$M_E = E_k + E_p$	

**CURRENT ELECTRICITY**

$R = \frac{V}{I}$	$q = I \Delta t$
$W = VQ$	
$R_s = R_1 + R_2 + \dots$  $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$	

**ELECTROSTATICS**

$E = \frac{V}{d}$	$F = Eq$	$F = \frac{kQ_1Q_2}{r^2}$
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